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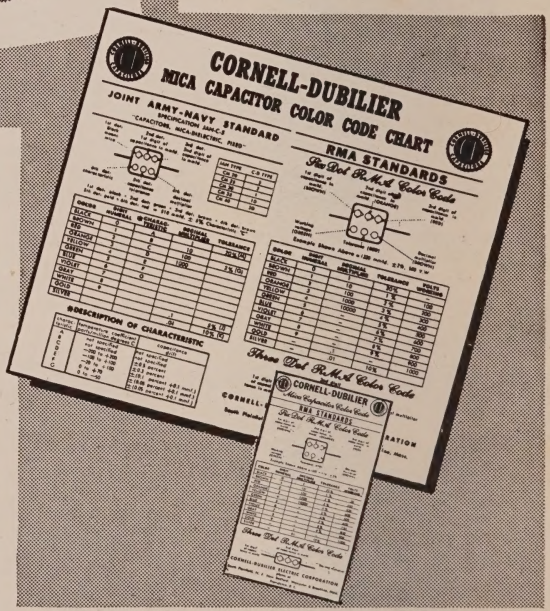

To help you quickly identify mica capacitors by the official RMA color code—C-D offers you a large wall chart to hang in your shop and small pocket-size cards for ready reference. You can see at a glance the characteristics, decimal multiplier, and tolerance as indicated by a distinct color for each number. These Color Code Cards and Charts are also available from your local C-D distributor.

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INITIAL TROUBLE-SHOOTING PROCEDURE*

on Electronic Equipment

This is "old stuff" to the experienced Radio serviceman. But the newcomer to this field or those who plan on entering it after the war, will find methods here that are universally used by successful maintenance men. It is generally easy to fix a trouble after you find it.

No matter how expensive or how well-built a piece of electronic equipment may be, there are certain to be occasional failures. The more complicated the system is, the more difficult it seems to service it. But all such systems are man-made, and they can be maintained by man—there is no magic in servicing. It may appear that the experienced technician uses a crystal ball to diagnose a trouble, but the only substitute for a detailed, systematic method of checking is a long backlog of experience.

Assuming that some failure occurs, make a complete survey of the system, even if it is a four-tube AC-DC radio set. Ask yourself a few questions: 1. What happened at the time of failure? 2. How did it act before the failure? 3. Are there any visual signs of failure? 4. How much of the system is affected? Then, and only then, begin the diagnosis.

Consider, as an example, a high-grade FM-radio-phonograph combination which has suddenly ceased to play. In most such cases, the serviceman is not present at the time of the failure, so he will have to ask. In answer to the first question, then, it develops that the radio was playing an AM station; a hissing sound was heard, then silence. The set was turned off, and the serviceman called.

How did it act before the failure, you ask. Well, it seems that it was all right until a week ago Tuesday during the Bob Hope show. It made that same hissing sound, the program faded out; then after about two minutes, it came on again. It has worked all right ever since.

The third question must be answered by the serviceman himself. He *looks* at it. He turns it on. Nothing happens. But there *is* a little hum in the speaker, quite normal. He switches to FM; it is too early for any program, but the background noise is normal. So he tries the phonograph. Ah! it works. What has been learned so far?

The dial lights are on, and the set plays on FM and phono, so the power supply must be "OK." The audio system must be all right. The FM section must be all right. The trouble is localized to the "front end" of the AM receiver, either the I-F stages, the R-F stages, the first detector, or the oscillator.

That is only a sample of the way trouble-shooting is done. Localize the trouble to the smallest possible part of the system. If there are 27 tubes in a system, there are probably ten times that many components, any of which could be at fault. It would take hours to check each one individually. If the trouble can be localized to the circuit of one single tube, there will probably be about ten possible places for failure. So it is obvious that a simple, workable trouble-shooting system should begin with localization.

** By Gordon Edwards in "Radio Maintenance."*

But bear in mind one cardinal principle. Any trouble-shooting method should be followed carefully. Do not try hit or miss guesses until your own experience is great enough that the guesses are really only short-cuts. Experience will tell you that a certain type of equipment is apt to fail in a certain place.

Select a method, then, such as is outlined here, and follow it systematically. All electronic equipment uses power from some source, so that is a good place to start. All electronic equipment uses tubes, so that is a good place to check next. Assuming these to be normal, localize the stage at fault, and then determine the exact part that failed.

Checking Power

The first step in checking power is to determine if the source is actually "hot." If the equipment is battery operated, check voltages *under load,* that is, with the equipment turned on. Dry batteries will often test normal with a meter that draws only a milliampere or so, yet the internal resistance may be so high that the available voltage output under load is low. Testing with the equipment on will show up this defect. Low battery voltage will often cause failure of an oscillator tube to function.

For storage batteries, the same conditions obtain, though the method of testing is different. Measure the voltage with the equipment on, and test the gravity of each cell, or pilot cells.

If line-powered, determine if the line voltage is normal. For AC-DC equipment, check to see that the plug is inserted properly on D-C lines so that the positive terminal of the equipment is connected to the positive side of the line.

In permanent installations, some form of indicating device such as a meter or lamps will generally indicate the condition of the power source. After the source is found to be "hot," check the fuses or circuit breakers. In short, take every care to be sure that power is actually reaching the equipment. Many radio service calls have been made only to plug in the line cord and many more, in D-C districts, to reverse a plug.

Checking Tubes

In receiving equipment, tube checking is a simple operation, and immediately removes the tubes as a source of trouble. No tube checker is 100% accurate, however, and in certain applications tubes can be checked only by substitution. This applies particularly to oscillators and to noisy tubes, and in such cases, it is well to make the substitution if a spare is available.

Transmitting tubes are more difficult to check. Few users have the facilities for regular checks of the characteristics of transmitting types. On the other hand, the manufacturing tolerances of these types are much more rigid.

Tube testers take many forms. A simple check on the electron emission of the filament or cathode is effective in about 90% of all tube defects. This type of tester is simple and generally inexpensive. With increased complication, testers are made which will measure the "dynamic output" of a tube, and depend for their operation on the change in plate current caused by applying an A-C voltage to the grid. This type of tester is not expensive, and gives reliable results on about 95% of failures. The more complex and expensive mutual conductance testers will show up perhaps 99% of all tube faults, and are of the best type for general use, provided the additional expense is justified. But even with the best possible tube testing apparatus, some tubes will test satisfactory, yet fail when placed in service. No tube test can be considered 100% accurate, and the technician must resort to substitution for final and certain surety of performance.

One necessary check for tubes is that of leakage. Modern testers have facilities for "short" checks that will show up shorts of as high as two megohms resistance between elements. There are

two reasons for such a check: (1) It protects the meter in case of leakage between high voltage elements and the grid, which would cause high plate currents and (2) in many circuits, any leakage between elements may disturb element potentials beyond operating limits. Cathode-heater leakage is often a source of hum, and will render many circuits inoperative.

The "gas" test is not furnished in all testers but is a valuable adjunct. If introducing a high resistance in the grid circuit causes an appreciable change in plate current, the tube is gassy, and should be replaced.

With all these doubts, however, a thorough check of the tubes is a necessary operation, and must not be overlooked in a trouble-shooting system. It must be appreciated that no electronic apparatus can function unless the tubes themselves are functioning properly.

Locating Stage

Assuming the power source is checked and is found to be normal, and that the tubes all test satisfactory, the next step is to locate the stage in which the failure has occurred. This can be done by various methods. In receiving equipment it is easy to begin at the last tube and check by touching the grid terminal of each tube with a metal object. A characteristic sound will be heard as each grid is touched. If there is a sound when touching the grid of the fourth tube in the set, but none for the third, it may be assumed that some component associated with the third tube is defective. In more complicated systems a different procedure is required.

The diagram herewith shows a simple system suitable for a small broadcast installation. Suppose the control operator hears a crackling noise in the monitor speaker. His first check is to close the mixer dials. If the sound stops, it must be in one of the pre-amps, or the input circuits.

If the noise continues, he should close the master gain control, which would stop the noise if it originated in the booster amplifier. Next he should close the monitor gain control, eliminating the line amplifier as a source. If the noise stops, it must have been in the line amplifier. If the noise continues, it must be in the monitor amplifier.

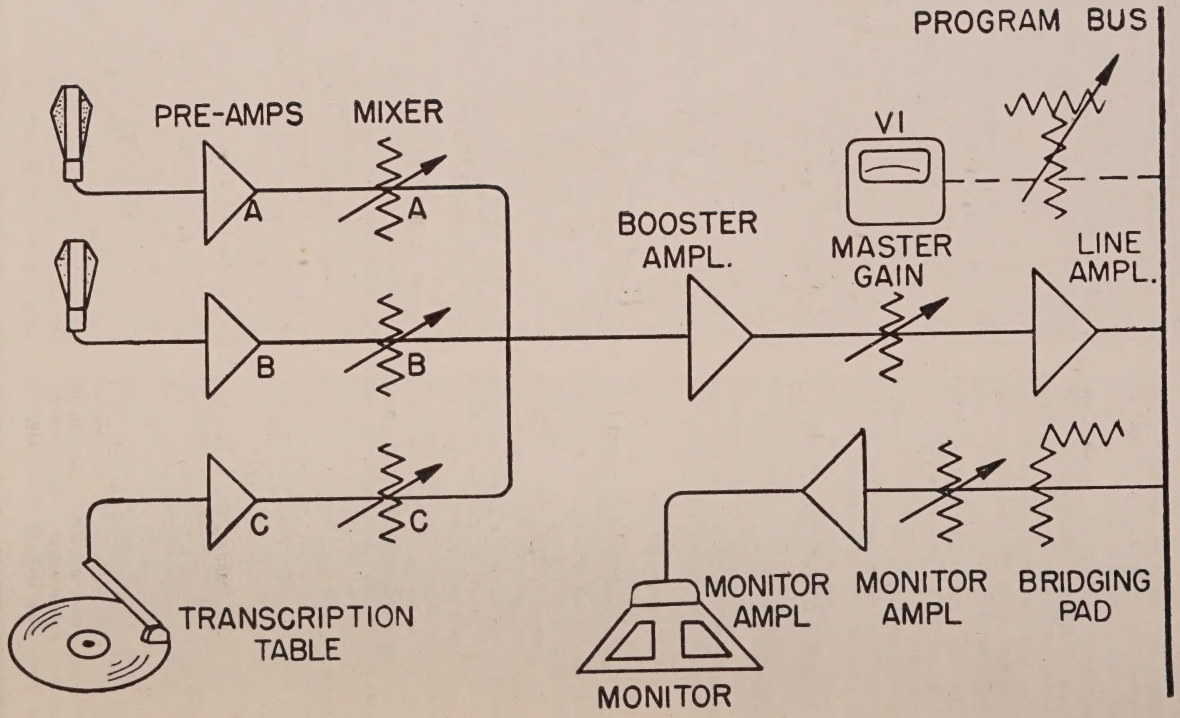
A volume indicator on the program bus would show up immediately whether the noise originated in the program circuit or in the monitor circuit. If the noise were in the monitor amplifier, it would cause no deflection of the VI; but if it were in the program circuit, the VI would indicate it.

This is only a simple example of the type of analysis required to locate a faulty stage. Familiarity with any system is required to determine a checking method for it which eliminates as many elements as possible as the source of trouble, but the principle of localizing should be understood and adapted to the equipment being serviced.

Checking Components of Stage

Having determined which stage is at fault, it becomes a simple matter, in most cases, to locate the defective component. In low voltage equipment such as receivers, voltage and resistance measurements at tube sockets should suffice; but in transmitting equipment, safety precautions eliminate voltage measurement as a suitable method.

Well organized maintenance material on electronic equipment should provide complete tables of voltage measurements at all socket terminals, and at any other critical points in the circuits. No voltage at a given terminal indicates an open circuit or a shorted capacitor. Low voltage at a plate terminal indicates high resistance, defective capacitor, or high plate currents. Low voltage at a cathode indicates low resistance from cathode to ground, a defective capacitor or low current. High voltages at plate terminals indicate open bleeders, low plate currents, or low resistance series circuits. High voltages at cathode terminals indicate high plate currents. Taken together, these measurements can be used to


PROGRAM BUS
PRE-AMPS
MIXER
A
A
VI
BOOSTER AMPL.
MASTER GAIN
LINE AMPL.
B
B
C
C
TRANSCRIPTION TABLE
MONITOR AMPL
MONITOR AMPL
BRIDGING PAD
MONITOR

determine the source of the trouble, and further continuity and resistance measurements are necessary to locate the faulty component.

Maintenance material should also provide resistance measurements between various tube elements and ground and between these elements and the plate supply. After making the voltage readings, measurements should be made of the resistance between various points and these results considered carefully. In most equipment, it should not be necessary to disconnect any parts for these measurements, until a very definite indication is obtained. Parallel resistors and capacitors must be separated to make final checks, but most circuits may be analyzed completely without this procedure.

Transmitting equipment is generally provided with sufficient metering to enable the technician to locate the source of trouble, though perhaps not the definite component. In such cases, individual resistance measurements on the components should be resorted to.

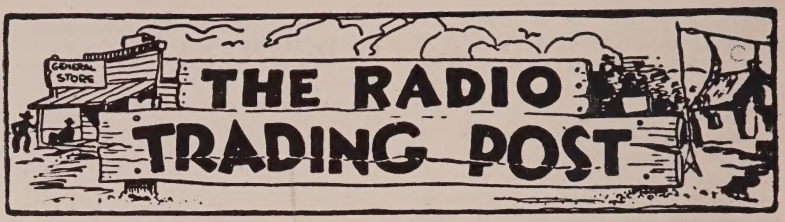
Capacitor checking can be done fairly accurately by means of an ohmmeter. Naturally, a shorted capacitor gives an indication of its condition, but "opens" are more difficult. With a capacity of .01 mf or more, a "kick" is noted when ohmmeter prods are touched to the terminals. Reversing the prods will then give a larger kick of the meter needle because the charge across the capacitor caused by the first checks acts as an additional voltage in series with the ohmmeter battery when the test prods are applied the second time. After this initial capacity-type kick, the ohmmeter should return to infinity. Any reading other than infinity indicates leakage, and in coupling capacitors, this condition demands replacement of the part. In filter and bypass applications, some leakage is tolerated, and, in the case of electrolytic capacitors, is always present. This leakage is in the order of 0.1 ma per microfarad at the rated operating potential. A low-voltage ohmmeter will not show this leakage accurately, but will indicate it to a certain extent. Capacity measurements are rarely necessary in servicing operations, as change in capacity is improbable. In electrolytic filter or bypass capacitors, aging is normally accompanied by loss of capacity, particularly where large A-C voltage components are present. Loss of capacity in filter circuits will cause increased hum, but seldom causes complete failure.

Transformers offer a problem in servicing when shorted turns develop. This fault, which is often occasioned by poor insulation, manifests itself by increased heating of the unit in plate and filament transformers. In audio-frequency transformers, poor frequency response and lower power - handling capacity will be observed. D-C resistance measurements will be affected but slightly, and insulation resistance from winding to winding or from winding to core is not necessarily affected at all. The only safe remedy in the case of a suspected transformer is to replace it with a spare. Inductance measurements on the windings will show up the defect, and if facilities are available for such a check, it should be made, provided the correct value is known.

In any kind of maintenance work, the technician should never lose sight of the safety requirements — even 115 volts can cause death. Before working on any high-voltage equipment, open line switches and tag them, remove fuses, put grounding wires on the danger points, and discharge capacitors. The slogan "Always Be Careful" is an easy one to remember. And remember also that "Death is so Permanent."

DISPLAY RELIABLE RADIO SERVICE PLACARD IN YOUR SHOP!

Available at your local jobber.
See Page 2.



A Free Market-Place for Buyers, Sellers, and Swappers.

These advertisements are listed FREE of charge to C-D readers so if there is anything you would like to buy or sell; if you wish to obtain a position or if you have a position to offer to C-D readers, just send in your ad.

These columns are open only to those who have a legitimate, WANTED, SELL or SWAP proposition to offer. The Cornell-Dubilier Electric Corp. reserves the right to edit advertisements submitted, and to refuse to run any which may be considered unsuitable. We shall endeavor to restrict the ads to legitimate offers but cannot assume any responsibility for the transactions involved.

Please limit your ad to a maximum of 40 words, including name and address. Advertisements will be run as promptly as space limitations permit.

WANTED—One 850 tube, 2 860 tubes and 1 861 tube, also 0-10 rf ammeter, 0-15 ac VM, 1-0-1000 and 3-0-300 mil meter. All 301 style or similar. Cash. N. K. Stover, P.O. Box 722, York, Penna.

SELL OR SWAP—De Vry 35 mm. portable motion picture projector Type J. 500 w. lamp, like new, best offer takes it. Mack, Box 123, New Hyde Park, N. Y.

SWAP OR SELL—Two 803, 3 954, all new, Miniature camera 16 ex., 4.5 lens, range finder, K-2 filter and case. Best offer takes. E. M. Swanson, 411 Eighth St., Palisades Park, N. J.

FOR SALE—L and N mirror galvanometer, $15, rim drive fono motor, $11; airplane motor generator, 30 to 350 v., $20. Need exposure meter. A. Dayes, 29 Charles St., Merrick, L. I., N. Y.

FOR SALE—Wollensak enlarging lens 3", f 3.5, dust cover and lens mount, $22.50; Precision resistors, 0.5% accuracy, 75c each, motor generator, 24 v dc, 125 amp. out, 3 hp, 110 v. input, $80.00. G. Moore, 148 Winthrop St., Brooklyn 25, N. Y.

WANTED—Late model tube tester, sig. gen., Riders Manuals, 1-14, other test equipment. Have various Xmtr and rec. tubes, supplies, to trade or sell. Clyde W. Jones, Rt. 3, Box 206, Hickory, N. C.

FOR SALE—Majestic radios and spkrs.; Philco radios and spkrs.; Majestic power pack for 90. Fada radio and spkr. Louis A. Goldstone, 1279 Sheridan Ave., Bronx 56, New York.

SALE OR TRADE — 1 Metropolitan CA10 signal tracer, $13; Solar CBI-60 condenser analyzer $35; battery operated sig. gen., 7 band r.f. output, 400 cy. audio output $20, less batts. Want—Port. Rec. and play back; small ac-dc multimeter; 30 w. 6 vdc-110 vac mobile sound amplifier. Ed. Petzold Elec. Co., 1122 Milwaukee Ave., S. Milwaukee, Wis.

FOR SALE OR TRADE—Several Alliance ac phono motors, Astatic crystal pick-ups, also complete portable record player. Small quantity 50L6, 35Z5, 6L6, 12SJ7, 812, 866, others, 50% off list. Want good guitar or 16mm movie camera. Joseph Haas, 23-54 31st Ave., Astoria, L. I., N. Y.

WANTED — Stancor pack to run auto sets or other pack; vibrator tester, Triplett or Radiact, Rider's Manuals, 6 to 14, single or as lot. For sale—Simpson 333 tube tester, VOM, used dynamic speakers. Royce Saxton's Radio Shop, Route 1, Pontiac, Illinois.

WANTED—Late NRI course complete. Give condition and price. Charles Scurto, 639 Point St., Houma, La.

FOR SALE—Superior 1280 tube and set checker, like new; Superior T-12 sig. gen.; Readrite sig. gen. 550 batt. op. as is $3.00. Some ac and dc meters, WE hearing aid like new. Edw. Vockerott, 1746 N. Campbell, Chicago 47, Ill.

URGENTLY NEEDED—January, 1945 issue of C-Q magazine. Will pay your price. Ed. Christner, 313 Crawford St., Middletown 12, Ohio.

(Continued on page 11)

SERVICING MESSED-UP SETS*

PART III

Some of the most difficult problems arise from incorrect replacements of defective units by inexperienced repairmen. Use of an output transformer with an incorrect inductance value, in one case, produced a distortion which was very difficult to diagnose. Pure hunch, based on signs that the transformer had been recently replaced, led the technician to substitute another transformer.

The difficulty of course, in these cases, lies in knowing what to look for. Any detective who was confronted with as many possible suspects as a radio serviceman is in dealing with a tampered set, would tear out his toupee and take up movie writing.

Using Oscilloscope

Radiomen who own oscilloscopes can use them to good advantage on many of these repairs. An incorrect volume control replacement in a duo-diode triode detector circuit may introduce a mysterious distortion that does not readily give up its secret. The 'scope can, probably more quickly than any other instrument, locate the source of the trouble. Signal input at the high side of the control may be compared with that at the plate of the preceding tube, localizing the source of the distortion.

An audio signal tracer may prove useful in servicing tampered radios. On one set, the repairer had made an

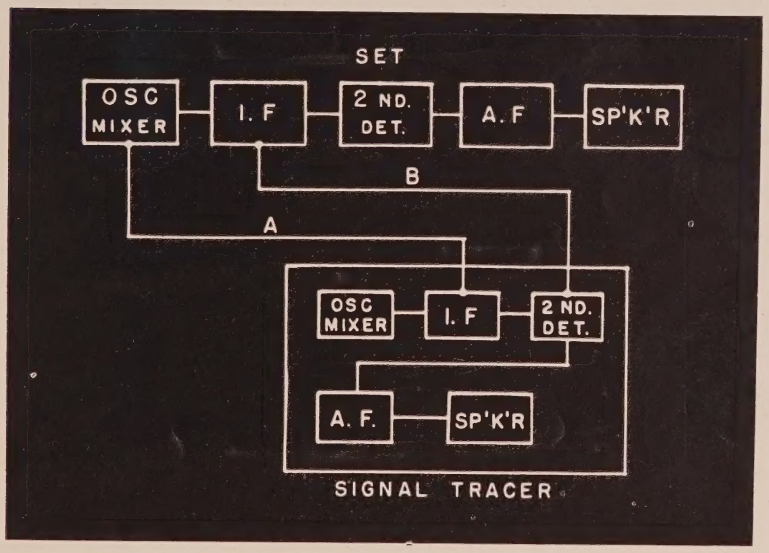


Fig. 4.—When signal comes through undistorted from osc. mixer, and distorted from the i-f stage, the i-f is obviously the source of trouble. A and B are connected alternately.

* *Courtesy of "Radio & Television Retailing."*

attempt to rewind an i-f coil, but had not wound sufficient turns on it. Since the coil was enclosed in a shield can, the amateurish job was not visible. Voltage tests gave no clue.

Signal substitution tests, however, revealed the trouble. Signal from the stage preceding the faulty one was fed into the appropriate stage in the tracer, and was amplified without distortion. Signal introduced from the defective stage into the tracer's amplifier, however, came through distorted (see Fig. 4).

A test oscillator was then used in conjunction with a v-t voltmeter to test the resonance response of the tuned circuit under suspicion. The highest output was not obtained at 465 kc, but at 450 kc or thereabouts (see Fig. 5). This led the radioman to remove the coil from its shield can and inspect it. The amateur rewinding job then became readily apparent.

Some readers may possibly feel that it should have been simple to compare the two identical i-f coils in the set for resistance readings, and deduce a defect in one of them if the readings were not the same. It should be noted that the technician did not suspect this sort of trouble, so that it never occurred to him to make such a comparison. Then again, a difference in windings sufficient to produce distortion might not necessarily result in a noticeable change in resistance.

Profit and Loss

Tampered sets generally bring small sums onto the black side of the ledger, and not infrequently appear on the red side, in terms of time lost in their repair. From a technical

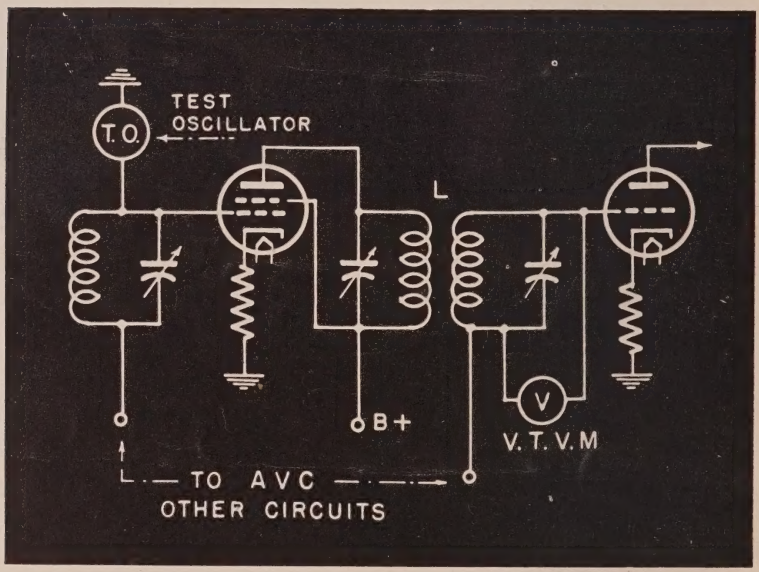


Fig. 5.—Signals of varying frequency but the same amplitude may be introduced into the grid circuit of the stage preceding the one containing i-f coil L, and the output across the secondary measured with a v.t.v.m. Highest output will not be received at the i-f frequency if either the coil or capacitor is defective.

viewpoint, however, they may bring the technician a great deal of additional knowledge. Radiomen who can quickly and satisfactorily repair every tampered set that comes into their shop, can award themselves an "E" for excellence—in skill, ingenuity, and alertness. Those whose repair records are not as good, may still cite themselves for a purple heart, for mental wounds received in the line of duty.

THE RADIO TRADING POST

(Continued from page 8)

FOR SALE—Hughes Mitchell 10 meter converter rec. for car radio, $10; Hallicrafter FM level indicator $5; 2 Abbott MRT-3 transreceivers 2½ meters with power supply and mikes, $55 each. K. H. Stello, PO Box 291, Dallas, Texas.

WANTED—Sound equipment suitable for use in church and auditorium. Also interested in recording equipment. Rev. Gordon C. MacDonald, 56 School Street, Manchester, Mass.

FOR SALE—Wavemeter for all amateur bands to 10 meters $5; BUD band switching turret coils $5; 6 v. dynamotor from plane $10; auto radio vibrapack $10; ARRL handbook, all above $25. K. H. Stello, 4234 Maple Ave., Dallas, Texas.

WANTED — Ac voltmeters, dc milliammeters, hi-voltage condensers, filter and variable type. Short wave receiver portable for 56 mc, also one for regular sw fixed station operation. V. C. Hawerdel, 102 Hancock Ave., Jersey City, N. J.

FIRST $50 MO takes Triplett analyzer, mod. 1200-E and Triplett tube tester 1212, complete with test leads and charts. Very good condition. Will ship prepaid express. J. F. Intiso, 1837 Hunt Ave., New York 60, N. Y.

FOR TRADE—Have Dunlap metal lathe with chuck and all gears, less motor, and all metal floor stand, perfect condition for lathe. Has screw cutting attachment. Want genuine French Selmer balanced action E flat alto saxophone. Aaron Sloin, 255 Tioga St., Trenton 9, N. J.

FOR SALE — Weston 4¼" square type meter, 0-50 microamps, with mod. 772 calibrated dial, also Weston ac rectifier and four precision wire wound resistors, all new. J. Holloway, Box 133, Haddonfield, N. J.

WILL SWAP—Complete Sprayberry radio course for test equipment, or what have you? John Palencak, 302 E. Genesee St., Flint 5, Mich.

WANTED—8 mm movie camera and 8 mm projector, state make, condition, and price. Guido Paolini, 88 South Street, Westboro, Mass.

SALE OR TRADE—Numerous ham equipment. Two crystals 3514.5 and 3790 kc; Weston meters; hi-power transfs., conds., chokes, etc.; tubes 211-E, 210, 81s. 3 K &S slide rules, radio engr. books, C-D Decade Capacitor, mod. CDB-5. Need good sig. gen.; Rider's Manuals 7, 8, 11, 12, 14; Neon radio service sign or recorder. Anthony Kiburis, 344 S. 4th St., Brooklyn 11, New York.

TESTERS FOR SALE — Supreme 589 tube tester, Superior PB 200 VOM, Radio City 442 VOM, Supreme 561 metered sig. gen., Hickok RFO-4 3" oscillograph, Philco 030 sig. tracer, 10 amp. batt. charger, "A" eliminator, Emerson dynamotor. Ed. Christner, 313 Crawford St., Middletown 12, Ohio.

FOR SALE—3" F 3.5 Wollensak enlarging lens, mounting, dust cover, $22.50 List of plans for home construction, furniture, wood working machinery, kitchen cabinets, plastic items for resale. List for stamped envelope. Want Precision E V10 VTVM. J. W. Bourke, 148 Winthrop St., Brooklyn 25, New York.

SWAP—2 new GE 211 tubes with sockets and 3 new 807s for 2 new RCA 812 and high voltage plate transformer, 1500 v. at 300 ma. after filter. George Pierce, 3 Avon St., Houlton, Maine.

FOR SALE—Kodak 616 special f 4.5, like new, complete line of accessories, filters, portrait attachment, tanks, films, exp. meter, case, $70; Baldwin phones, type C, $4; Auth phone, 1100 ohms, $3; Jewell test panel with ac meter and dc-ma meter, $10; Jensen speaker mod. 12, $13. Wm. Rasmussen, 91-37 184th St., Jamaica 3, New York.

SWAP—Taylor clock-motor recording barograph, ok condition, for FM sig. gen. or oscilloscope in ok condition. L. C. Chapman, Rt. 1, Columbus, Miss.

FOR SALE—New sig. gen. Superior, mod. 850 ac, 100 kc to 33 mc, fundamentals 33 mc to 99mc harmonics. Have another instrument on order. List $29.50, make offer. Robt. L. Patterson, 104 Carlton Ave., Brooklyn, N. Y.

FOR SALE— Marlin lever action low power rifle; mag. holds 16 32 shorts, $30.00, also Emerson 6 v. batt. radio set, 1939 mod., $25 post paid. Snyder's Radio Service, P. O. Box 321, Sunbury, Pa.

SELL OR SWAP—Brewster 8 tube FM converter, like new. GI recorder-mixer record changer and Kodak Bantam spec. F:2, 1/500 sec. camera, slightly used. Want test equipment, sw receivers, etc. A. M. Platt, 4102 Bowser, Dallas 4, Tex.

FOR SALE—I can supply most any kind of radio tubes at list. Also parts, etc. For any article in radio and electronics write O'Brien's Radio Service, 266 W. 4th St., Fulton, N. Y.

CASH—For old issues of Modern Electrics; Electrical Experimenter; G. E. Review; Popular Electricity, June and August, 1909. John T. Lipani, 157 Leverett St., Boston 14, Mass.

SELL OR SWAP—902-P1, 3AP1, 5BP1 cathode ray tubes, RCA crystal and aerodynamic mikes, 0-1 milliamp. dc meter and precision multipliers; for receiving tubes, opera glasses or postage stamp collection. B. Bernbaum, 5746 North Park Ave., Philadelphia 41, Pa.

FOR SALE — Meissner 9-1040 analyst in original carton, never used. Complete with all accessories, $94.32. Senate Radio, 136 Highlawn Ave., Brooklyn 23, N. Y.

FOR SALE—Radio tubes at list price. Send for list, or send deposit and will ship COD. A. Valentino Radio Service, 57-13 69 St., Maspeth, L. I., N. Y.

FOR SALE—Gardiner, mod. S code tape puller and keyer with 10 punched code tapes, practically new, 110 ac operation, $15. J. J Bobrow, 121 West 27th St., New York City.

FOR SALE — Sprayberry radio course, complete, A1 condition. Make offer. National Graflex with B & L F 3.5,, case, and accessories, Lendi meter. Electroplating outfit. Charles Havranek, 444 Broadway, Bayonne, N. J.

FOR SALE—Meissner de luxe Signal Shifter brand new in original factory carton. Conservatively rated at 7.5 w. Freq. range 1000-16,500 kc. By doubling 23,000 to 30,000 kc. One set coils, specify frequency $50. Baeff Radio Co., 3012 South Jefferson, St. Louis 18, Mo.

FOR SALE OR SWAP—Weston 0-10 milliammeter, Jewell 0-6 v. and Jewell 0-25 milliamps, all 3½" meters in perfect condition. Also Solar condenser tester, mod. BQC. Need set Rider's Manuals, make offer. Wills Radio Service, 215 S. Michael St., St. Marys, Pa.

FOR SALE—Sensitive dc relays, will operate with as low as 1/100 of a w. Coil resistance 8000 ohms. Contacts single pole, double throw, rated 2 amps. at 115 vac. $1.00 each. Mack, PO Box 123, New Hyde Park, N. Y.

SALE OR SWAP—Crosley 32 v. power pack, formerly used with 7-tube set. 6 v. genemotor delivers 200 v. at 100 ma. Two 6v power packs complete as used in Ford-majestic car radios. Want 3 or 5 shot repeater 12 or 16 gauge, or what have you. John Meek, 5619 W. Chicago, Detroit 4, Mich.

TRADE—Compact 1500 watt gas engine generator set, run six hours, wt. 100-125 lbs., complete with gas tank, automatic cut-out, etc., for late model Hallicrafter, or will sell. F. M. Lumley, 350 E. Gillespie, Flint, Mich.

WANTED—A partnership or position in a growing radio and appliance service shop, in or near Chicago's southwest side preferred. Interested in sound reproduction and its associated systems. Joseph Prendergast, 7744 S. Marshfield Ave., Chicago 20, Ill.

FOR SALE—3 stage ECO and Xtal 100 w. output transmitter (HK54 tube) complete with power supply and antenna tuning panel, all rack panel mounted. Sell complete or separately at less than cost of parts. Herman Yellin, 351 New Lots Ave., Brooklyn 7, N. Y.

FOR SALE—Teleplex with built-in oscillator; 7Y4, 7B7, 7C7, and other types; 3 Coto Xmtr coils, 160 meter, new; 15 in. Jensen spkr., with rectifier for field. new and used radio books and mags. Bernard Smith, 920 So. Euclid, Pasadena 5, Calif.

FOR SALE — Rider's Manuals 6 and 7, $6.50 and $9.00; complete vibrator power supply, $10; 4 new non-synchronous vibrators, $10; 1 new syn. vibrator, $3.50; Supreme analyzer, $25; Sterling's "The Radio Manual," $4.00. Mrs. Oliver Martin, Jr., Croghan, New York.

SALE OR SWAP—Collins 32 B radio transmitter, AT cut crystals, transmitting tubes, floor model console Philco all-wave remote control, Rolleiflex f 2.8 Zeiss-Tessar lens camera, Sheffield old silver plate. Want good communications receiver, kw transmtr. Geo. Pasquale, 601 Bashford Lane, Alexandria, Va.

FOR SALE—Two used Philco auto radios and one used 8 tube Arvin, $25 each. 2 ¼ HP motors, $14 each. One .25 calibre automatic, $15. Paul Capito, 637 W. 21 St., Erie, Pa.

FOR SALE—15 6L6, 80c; 14 6N7, 75c; 12 5T4, 80c; 10 6K8, 65c; 25 6SN7GT, 50c. All tubes new, not boxed. Bargain price for lot. Fred Humphrey, 117 N. 20th Street, Philadelphia 3, Pa.

FOR SALE—Vacuum tube voltmeter. Up to 600 v. dc in four ranges. Also reads ac. Used, but in perfect working condition; complete with new tubes. Send $9.50 cash or money order. John S. Jackson, 166 North Sierra Bonita, Pasadena 4, California.

FOR SALE—18" square panel meter. Checks dc v, to 600; dc ma to 300; ac v. to 800; ac ma to 200; ohms to 20 meg. Cap. ½ mfd. and .5/25.120, 60 cycle line. Employs 2 5" Hickok meters. $35, cost $120 when new. Ernest Kumfert, 21 Walker St., New London, Conn.

FOR SALE—Complete radio and refrigerator sales and service business and building. Good stock and business, owner retiring. Must sell at once, cheap. Write for details. Leo L. Bowman, 615 W. Main St., Lewistown, Montana.

FOR SALE—Pocket size Bernard ac-dc multitester, 1000 ohms per volt, uses 3" square type meter. Unit in perfect operating condition, $15.00. Jack Goldstein, 151-09 34th Ave., Flushing, L. I., N. Y.

WANTED—Riders Manuals, will pay cash. For Sale—Jensen theatre speaker, one genemotor, one Racon trumpet, two giant Racon units. Carr Electric Products Co., 17 Kelly Sq., Worcester 4, Mass.

FOR SALE—3 stage ECO and crystal 100 watt output transmitter, HK54 output complete with power supply, antenna tuning panel, all rack mounted. Sell complete or separate, at less than cost of parts. Herman Yellin, 351 New Lots Ave., Brooklyn 7, New York.

METERS—I need lots of 3, 5, or 6 v. meters, and 6 v. bell buzzers, the cheap type. Send types you have and price in first letter, also 2, 3, 4 in. speakers. Have $100 worth radio parts to sell or swap. F. A. Cabon, 6017 Sunset Blvd., Los Angeles 28, Calif.

FOR SALE — DC motor generator, Elec. Spec. Co., type F-22, 1750 rpm, 220 v., 9.5 amp.—2,000 v. 0.5 amp., cast iron base included, C-H starter and enclosed switch, FOB, Cambridge, Mass. John Weare, 457 West 57th Street, New York 19, N. Y.

WANTED — Old used radio equipment: eliminators, high power transformers, tubes, repair parts. For Sale, bargains in radio tubes, parts, supplies. Radio-Electric Labs., 715 N. 7th St., Lake City, Minn.

FOR SALE—2 Racon dynamic super giant units, Amplion master dynamic unit, 6 ft. curled expotential horn, RCA 14" wide range speaker, heavy duty. J. J. Bressler, 211 West 12th St., New York, N. Y. Phone Chelsea 3-8070.

WANTED—Stancor master de luxe, mod. 133, heavy duty auto and radio service pack, or model 132, 125, all radio packs. L. C. Chapman, Rt. 1, Columbus, Miss.

WANTED—Channel analyzer, cap meter, sig. gen., VOM and VTVM, tube tester and Riders Vol. 7 to 14, must be in A1 condition. State price and describe in first letter. G. Brokaw, Rt. 4, Box 544, Stockton, Calif.

FOR SALE OR TRADE—1 RCA communication receiver, mod. AR-77, one 10-tube FM receiver, 3 Astatic xtal pick-ups, mods. S8, S12, new, three-quarter size bass violin. Wanted—A good recorder. 30w amp., or transmitter. Gerald Hess Radio Service, Moravia, New York.

FOR SALE—Underwood No. 5 typewriter, recently overhauled, $50; will take some critical tubes on deal. New RCA portable radio 94BP-1 $25, less batteries. New guaranteed unopened tubes at list. Will trade new tubes. Goodwin Radio Shop, Rankin, Illinois.

FOR SALE—Eight used RCA 800 and several WE 242C tubes. Make offer. One new RK-47, new price, no priority. Edwin L. Robb, c/o WAOV, Vincennes, Indiana.

FOR SALE—Emerson batt. set, table mod. takes 2 45 B bat., 1 1½ v. A batt., $17 post paid. All types radio tubes in stock. Snyder's Radio Service, P O Box 321, Sunbury, Pa.

FOR SALE—Two speakers, nearly new 8" Rola, mod. K 8, 1000 ohms. Best price takes them. Grillo Radio Shop, Milford, Mass.

FOR SALE OR TRADE — Warner Brush electroplater, battery type, with battery. one 3 oz. jar copper electroplating compound, jar of nickel-silver, 2 3 oz jars pure 24 karat gold and instruction book. $25, or what have you. Alex Poch, Box 174, Dillonvale, Ohio.

FOR SALE—Mod. 589 Supreme tube tester, brand new, $39.50, half cash, balance C.O.D. Xavier Curio, 1729 Victor St., Bronx 60, N. Y.

WANTED—Model 077 signal generator and model 010 condenser tester. State price and condition. Cpl. Fred Centanni, Sqdn. B, Gore Field, Great Falls, Mont.

WANTED—Five tube battery radio, 1½ v. type, several bands, with or without cabinet, with tubes or otherwise. State warranty. L. C. Chapman, Rt. 1, Columbus, Miss.

FOR SALE—Janette rotary converter, 32 v. dc to 110 ac, 150 watt, like new. Junior executive 2 way inner communication call systems, brand new; Philco HR-1, new recorder, with mike, for Philco 1941 radio combination. Clough Brengle audio oscillator, mod. 79c, perfect. Earl H. Stevens, Rt. 1, Bourbonnais, Ill.

FOR SALE OR SWAP—30 watt Operadio portable sound system with 12" speakers, velocity mike, in split case, value $200. Need sig. generators, RF and AF, signal tracer, tube checker. Montross Sound, 3333 6th Ave., Troy, N. Y.

WANTED—Riders Manuals, 1 to 14 incl. or will buy single copies 8 to 14, need VT voltmeter, sig. gen, RCA chanalyst, and good tube tester. McCormick Radio Service, 503 Adams, Johnston City, Illinois.

FOR SALE—Dunlap heavy duty bench saw, $25.00; Dunlap 4" jointer-planer, $20. Both machines A1 condition. Write for details to Clyde W. Wimer, 800 Wampum Ave., Ellwood City, Pa.

SELL OR SWAP—Webster portable PA, 15 watts, with two speakers and floor stand, Shure Xtal mike, provision for extra PM speakers. WANT 5" Dumont Scope. C. L. Lawrence, Rodman Road, Framingham, Mass.

WANTED TO BUY — Schematic diagram and operating data for Radio City tube tester, model 800. Will pay any price. Gregory's Radio Shop, 3648 Bailey Ave., Cleveland 13, Ohio.

FOR SALE — NRI code teaching outfit. Complete except for last lesson, one tape slightly damaged, otherwise in A1 condition. Make Offer. Radio Repair Service, PO Box 15, Lebanon, Pa.

FOR SALE—Remote tuner for any broadcast receiver and Keystone f 2.9, mod. A-7, 16 mm movie camera, make offer. Wanted 35 mm. or 2¼"x3¼" camera and flash attachments, also 16 mm. projector. I. Zambakian, 347 Belleville Ave., Bloomfield, N. J.

FOR SALE—Genemotor, 6v. input, 300 v. output dc, Hollywood motion picture sound projectionist course, 20 lessons, best offer. Len Cross, 1002 Tourmaline, San Diego 9, California.

WANTED — One 12B8-G vacuum tube, needed for use in invalids bedside set. S. R. Manning, 1365 Cass Ave., Detroit 26, Michigan.

FOR SALE—Volume controls, Allen Bradly type J, 10c each. Relays, dpdt silver contacts 24 v. dc can be rewound for 110 v., 95c each. Diamond Electric Co., 7320 So. Broadway, Los Angeles 3, Calif.

WANTED—Record-changer, either with radio or own amplifier. Need 70L7, 50L6, 25Z6, 12SA7 tubes. Will trade other tubes or pay cash. V. H. Hein, 418 Gregory St., Rockford, Illinois.

FOR SALE — Federal enlarger No. 219, Kodak No. 1, folding camera, safelight, Haynes MCM photometer, combination rangefinder and exposure meter, synchronizing flash unit, 2 developing tanks and numerous other photo supplies, $50. Want signal gen. Ernest Kumfert, 21 Walker St., New London, Conn.

FOR SALE—1/5 HP motor, Delco, 110v dc, like new. Make offer. Edw. C. King, Jr., 129 East Marie St., Hicksville, N. Y.

FOR SALE OR TRADE — DeForest radio course, over 90 lessons, radio and television. Need communications receiver, Hallicrafter preferred. George B. Martin, Box 111, Campbell Hall, N. Y.

WILL SELL—W-E 5" scopes with 5BP4 white television tube. Extra heavy duty transformers, chokes, etc. Good foundation unit for television receiver. With 12 tubes and carrying case. Tested and demonstrated. $50. Island Instrument Co., 368 Willis Ave., Mineola, N. Y.

WANTED—Rider's Manuals from 1 to 5. Must be in good condition. Will pay cash. Sullivan's Radio Service, 30 East 2nd St., Duluth, Minn.

WANTED—25 shells for Colt .45 automatic. Colt new service revolver, .38 special, 6" barrel, square stocks, no junk. Harold Buckley, 1337 Marlowe Ave., Indianapolis 2, Ind.

WANTED—Riders, vols. 11, 12, 13. Please state condition and price. J. P. Adrosko, 914 Lafayette St., Elizabeth 4, N. J.

WANTED—4" joiner, small bench band saw, small bench drill press, ¼". Give details, price, first letter. Thomas J. Mayes, Ironton, Mo.

WANTED—Set of Rider's Manuals, Thos. Fenimore, 201 York St., Burlington, N. J.

FOR SALE—Latest Weston tube checker, 777, brand new, checks all tubes, all voltages. H. Gursh, 1481 Shakespeare Ave., New York 52, N. Y.

FOR SALE — G-E combination turntable, pick-up and auto record changer in cabinet, plus 7 albums records; 10 to 20 watt Mills studio amplifier (6 or 7 stages amplification, vol. exp., 6L6's output) and heavy duty 12" spkr. High bid. H. Dramer, ARM 1/c, 8-C Radio, Corry Field, Pensacola, Fla.

FOR SALE—Supreme electronic voltmeter, mod. 549, complete with instruction book and leads. Little used, $35.00. L. R. Battersby, 206 Branch Ave., Red Bank, New Jersey.

WANTED—Circuit to a Hickok model 147 tube tester. Will pay $1.00 for same. Supreme Radio Service, 2620 Tracy Ave., Kansas City 8, Mo.

FOR SALE—Solar model CC-1-60 capacitor checker in brand new condition, with leads and charts, $30 f.o.b. Also Superior, mod. 1280 tube tester and VOM, A1 shape, all tubes to 117 volts. With leads and charts, $20 f.o.b. A. Brindley, 2821 Girard Ave., Philadelphia 30, Pa.

FOR SALE—Beam power 12 v. filament radio tube SC 1632, good for many substitutes, $1.00 each. Lewis, Room 702, 54 W. Illinois St., Chicago, Ill.

SALE OR TRADE—Several items in testing equipment, books, manuals, also Underwood typewriter, French Colemont binoculars, clippers, etc., send for list. Want Hammarlund Super Pro or similar sw receiver, condition not important, others considered. Glenn Watt, Chanute, Kansas.

FOR SALE — RCA Victor, mod. 26x1, 6 tubes, ac-dc. 2 bands, 535-1720 kc and 8700-15600 kc, $32.50, good condition. W. O'Brien, 266 W. 4th, Fulton, N. Y.

CONTACT me for radio parts, tubes, etc. Also have some small radios for sale. All letters and cards answered. W. O'Brien, 266 W. 4th, Fulton, N. Y.

FOR SALE—Tubes, mostly Philco, in sealed cartons, at list prices. Send for list. Herbert Levinson, 2422 N. Natrona St., Philadelphia 32, Pa.

WILL SWAP—Precision Multi-meter, series 856, practically new condition for Precision series E-200 signal generator in similar condition. J. F. Intiso, 1837 Hunt Ave., New York 60, N. Y.

FOR SALE—Nearly new Radio City Products Co. tube tester, mod. 308. Best price takes it.Grillo Radio Shop, 58 Forest St., Milford, Mass.

WANTED — Radio test equipment; Rider Manuals, will pay cash. John J. Levine, 17 Kelly Square, Worcester 4, Mass.

WANTED—Western Electric or RCA condenser microphone, portable typewriter. Will swap test equipment. Frank Dane, 3852 Eagle St., San Diego, 3, California.

FOR SALE—Majestic chassis and spks. Models 300, 130, 50, 320, 90B. Philco chassis and spkrs., Models 111, 96, 78, 76. Brunswick, Fada, Kolster radio chassis and spkrs. Kolster K-5 power amplifier and large dynamic spkr., brand new. Louis A. Goldstone, 1279 Sheridan Ave., Bronx 56, New York, N. Y.

WANT—Micro and milliammeter, also all Rider's manuals. State price and condition. A. E. Miller, 221 N. 18th Ave., Yakima, Wash.

WANTED—Contact mike for guitar and musical instrument; 16mm projector and camera. Will trade or sell 15-18w. amplifier, small transmitter, typewriter, elec. fans, motors, saws, radio parts, also cash. John Arnold, P. O. Box 84, Bluffs, Ill.

WANTED—Course or books on watchmaking tools, etc. Riders 10-13, Radio text books. Trade field glasses, 35 mm camera, rifle scope, books, or cash. W. J. Closson, 295 8th Street, Troy, N. Y.

FOR SALE—32v. dc-110 v. ac, 200 watt converter, filtered. public address system, has 2 250, 2 281, 2 26 and 1 27 tubes. Will push two Fox units. Made by Cash-Hughes. George Johnson, 28932 Cambridge, Garden City, Mich.

FOR SALE—New radio tubes, 1 or more each series, 1C5, 1LB4, 3A8, 6F5, 6J7, write for list of many others. List price less 15%. Elmer A. Glandorf, Williamsburg, Iowa.

FOR SALE—Bargains. 10 spindle Boley tapping mch. adjustable spindle positions. 10 spindle P. & W. drill press, adjustable spindle positions. Centre Machinery Co., 249 Centre St., New York 13, N. Y.

SWAP—0-10 ammeter will swap for 2 50L6 tubes. J. M. Slocik, Box 66, Springdale, Pennsylvania.

FOR SALE—2 home made amplifiers. Tube complements, 2-6V6, 1-6SC7, 1-6SK7, 1-80. 1-6L6, 2-6SK7, 1-80. Speakers not furnished. $25 each. Robert D. Freed, 1140 Fifth Ave., New York, 28, N. Y.

TRADE OR SELL—Electric 8" fan, 2 amp. tungar charger, 1 amp. copper oxide charger. Several voltmeters, write for particulars, movie projection course. I need photography equipment. Stanley J. Zuchora, 2748 Meade St., Detroit 12, Mich.

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